J.H. BAXTER & CO., a California Limited Partnership

WA 3019
9/16/05 10B

JHBaxter

FILE COPY

September 16, 2005

RECEIVED
SEP 1 9 2005
Office of Air Waste & Toxics

Ms. Jan Palumbo, RCRA Project Manager
United States EPA, Region 10
1200 Sixth Avenue, Mail Stop WCM-121
Seattle, WA 98101

Subject: **Supplemental Dissolved-phase Groundwater Monitoring Plan**
J. H. Baxter & Company Arlington Facility
J.H. BAXTER AR
Docket No. RCRA-10-2001-0086

Dear Ms. Palumbo:

In accordance with your letter dated August 24, 2005, J.H. Baxter & Company (Baxter) is submitting this *Supplemental Dissolved-phase Groundwater Monitoring Plan* to the U.S. Environmental Protection Agency (EPA) in accordance with Section XXVI (Additional Action) of the Administrative Order on Consent (AOC) between Baxter and EPA.

This plan includes the collection of additional groundwater data that will be used to evaluate and select remedial action alternatives for groundwater during the Corrective Measures Study (CMS). The scope of work discussed in this plan includes a one-time collection of geochemistry parameters from ten onsite monitoring wells, as well as quarterly monitoring of seven monitoring wells to evaluate the distribution and trends of contaminants of concern (COCs) in groundwater. All field work, field and laboratory quality control and quality assurance, and health and safety activities will be performed in accordance with the EPA-approved *Site Investigation Work Plan* (May 15, 2002).

Background

For the last several years, Baxter has been conducting a groundwater monitoring program in accordance with the Washington Department of Ecology's (Ecology) State Waste Discharge Permit (SWDP); monitoring the North and South Closed Woodwaste Landfills under the direction of the Snohomish County Health Department; and monitoring activities associated with the Site Investigation (SI) being conducted in accordance with the AOC. During the SI, the general characteristics of a dissolved-phase plume containing pentachlorophenol (PCP), and to a lesser extent polycyclic aromatic hydrocarbons (PAHs) were delineated. The site layout is shown in Figure 1. Groundwater elevations are shown in Figure 2.

Following completion of a new stormwater treatment system (which resulted in a new SWDP that did not include groundwater monitoring), and completion of the SI, groundwater monitoring

85 N. Baxter Road P.O. Box 10797 Eugene, OR 97440-2797 Phone 541 689 3801 Fax 541 689 8303

activities (other than landfill monitoring) were temporarily suspended in January 2005. This plan intends to provide an outline for collecting geochemistry data from many of the existing site wells, as well as to outline a program to continue monitoring the existing dissolved-phase PCP plume at the site.

Additional information concerning the site operational history, aquifer characteristics, COCs, and historical groundwater data is presented in the *Site Investigation Report*.

Geochemistry Evaluation

To assess the geochemistry of groundwater at the site, Baxter proposes to collect data from nine onsite wells and one offsite well. The selected wells include background wells, wells within the plume, cross-gradient wells, and downgradient wells. The selected wells are shown in Figure 3. The geochemistry data will be collected concurrent with the first quarterly sampling event, and will include field parameters, dissolved gases, and other geochemical parameters as discussed in more detail below.

Field parameters will include dissolved oxygen (DO), oxidation/reduction potential (Eh), temperature, pH, specific conductance, and turbidity. DO and Eh will be measured during well purging to assess the redox conditions in groundwater (e.g., aerobic/anaerobic, oxidizing/reducing), which reflect the general types of microbial activity that may be occurring in the subsurface. Since oxygen is the most favored electron acceptor used in the aerobic biodegradation of organic compounds, it is one of the first parameters to be affected by intrinsic biological activity. Dissolved oxygen concentrations provide an indication of potential anaerobic conditions. Eh is a measure of electron activities and is an indicator of the relative tendency of a solute or species to accept or transfer electrons. Because certain biogeochemical processes occur with specific Eh ranges, measurement of Eh in the groundwater provides a qualitative indication of the types of microbial activities to be expected (e.g., aerobic oxidation, nitrate-, iron, or sulfate-reduction, acetogenesis, or methanogenesis). Under either aerobic or anaerobic conditions, groundwater Eh within the contaminant plumes should be less than that measured outside the plumes. Typically, Eh values less than zero are indicative of strongly reducing conditions. Temperature, pH, specific conductance, and turbidity will also be measured during well purging to document that the groundwater sampled from each well is representative of the aquifer.

Groundwater samples will be analyzed for selected geochemical parameters to assess changes in the types and location of microbial activities occurring in groundwater. Geochemical parameters that will be analyzed for include alkalinity, nitrate, sulfate, chloride, dissolved gases (methane, ethene, and ethane), and ferrous iron. As discussed above, DO is the most thermodynamically favored electron acceptor in the biodegradation of organic contaminants. After DO has been depleted, nitrate may be used as an electron acceptor for biodegradation through the process of denitrification. Similar to dissolved oxygen, areas of the plume with lowered nitrate concentrations (compared to background) would indicate that anoxic biodegradation is occurring in those areas. After DO and nitrate have been depleted, ferric iron (Fe^{+3}), may be used as an electron acceptor. When Fe^{+3} is used as an electron acceptor during anaerobic biodegradation, it is reduced to ferrous iron (Fe^{+2}), which is soluble in water. Increased ferrous iron concentrations can thus be used as an indication of anaerobic biodegradation of contaminants. After DO, nitrate, and biologically available Fe^{+3} have been depleted, sulfate may be used as an electron acceptor for anaerobic biodegradation via sulfate reduction. During the process of sulfate reduction, sulfide is produced and sulfate concentrations in groundwater decrease. Methanogenesis is the production of methane during the biodegradation of organic contaminants. The presence of methane in groundwater is indicative of strongly reducing conditions and provides a good indication that the geochemistry of the groundwater system is favorable for reductive dechlorination, the primary process by which many chlorinated compounds biodegrade.

Areas of contaminant biodegradation can typically be identified by an increase in alkalinity. This is due to the production of carbon dioxide during the biodegradation of organic carbon. Areas within a contaminant plume typically exhibit increased alkalinity relative to background concentrations. During biodegradation of chlorinated organic contaminants, chloride ion is produced. Thus, areas of chlorinated organic compound impacted groundwater should exhibit increased levels of chloride compared to background. Ethane and ethene are ultimate daughter products of biodegradation and can be used as an indicator of reductive dechlorination. The presence of these compounds is an indication that site contaminants are being completely mineralized during biodegradation.

All geochemical parameters, with the exception of ferrous iron, will be analyzed at a fixed-base laboratory. Ferrous iron will be analyzed in the field using a portable HACH colorimeter. Field quality control samples will include one field duplicate sample and one equipment rinse blank for each monitoring event. The geochemical data will be used as part of the CMS to evaluate and select remedial action alternatives for groundwater.

Quarterly Groundwater Monitoring

The recommended approach for groundwater monitoring is to assess the quality of groundwater where it is potentially affected by COCs from historic operations. The wells selected for quarterly groundwater monitoring are shown in Figure 3, and described in more detail below:

- Plume area wells: MW-3, MW-15
- Cross –gradient wells: BXS-2, MW-2
- Downgradient Wells: MW-16, MW-17, MW-18

Groundwater samples from the seven wells will be analyzed for PCP by EPA Method 8151 and PAHs by EPA Method 8270C. In addition to collection of samples for laboratory analysis, field parameters will be collected during each purging and sampling events. Field quality control samples will include one duplicate and one equipment rinse blank for each sampling event.

For the purpose of this study, a minimum of four quarterly events will be conducted (one year); Baxter will discuss future groundwater monitoring activities with EPA following the conclusion of this study. Validated data will be provided to EPA with the monthly progress reports within 90 days of collection.

Methodology

Groundwater monitoring activities will be conducted in accordance with industry-standard protocols, including low-flow sampling methods, proper chain-of-custody, and the appropriate field and laboratory quality assurance/quality control procedures as identified in the *Sampling and Analysis/Data Management Plan*, included as part of the May 15, 2002, *Site Investigation Work Plan*. A summary of the monitoring schedule and analyses are included in Table 1.

We appreciate your prompt consideration of this *Supplemental Dissolved-phase Groundwater Monitoring Plan*. Following your approval, Baxter will implement these activities within 30 days. If you have any questions regarding this letter, please do not hesitate to contact me at (541) 689-3801.

Sincerely,

RueAnn Thomas

RueAnn Thomas
Environmental Programs Director

Attachment

cc: Georgia Baxter, J.H. Baxter & Co.
Mary Larson, J.H. Baxter & Co.
J. Stephen Barnett, Premier Environmental Services, Inc.

Table 1. Schedule and Analyte List

Description	Monitoring Wells	Frequency	Rationale
Water levels	16 Wells (BXS-1, BXS-2, BXS-3, BXS-4, MW-2, HCMW-5, HCMW-6, HCMW-7, MW-1, MW-3, MW-10, MW-11, MW-15, MW-16, MW-17, MW-18)	Quarterly	Quarterly monitoring to evaluate changes in water level and flow regimes.
PCP/PAH	BXS-2, MW-2, MW-3, MW-15, MW-16, MW-17, MW-18	Quarterly	Use quarterly PCP and PAH monitoring in key wells to evaluate changes in COC concentrations.
Field parameters (pH, dissolved oxygen, Eh, temperature, conductivity, and turbidity)	BXS-2, MW-2, MW-3, MW-15, MW-16, MW-17, MW-18	Quarterly	Collect field parameter data quarterly to verify proper purging methods and monitor water quality.
Geochemistry parameters (alkalinity, nitrate, sulfate, and chloride); dissolved gasses (methane, ethane, ethene); field ferrous iron; and field parameters	BXS-2, BXS-4, MW-2, MW-3, MW-10, MW-11, MW-15, MW-16, MW-17, MW-18	Once (first quarterly event)	Evaluate geochemistry of aquifer.

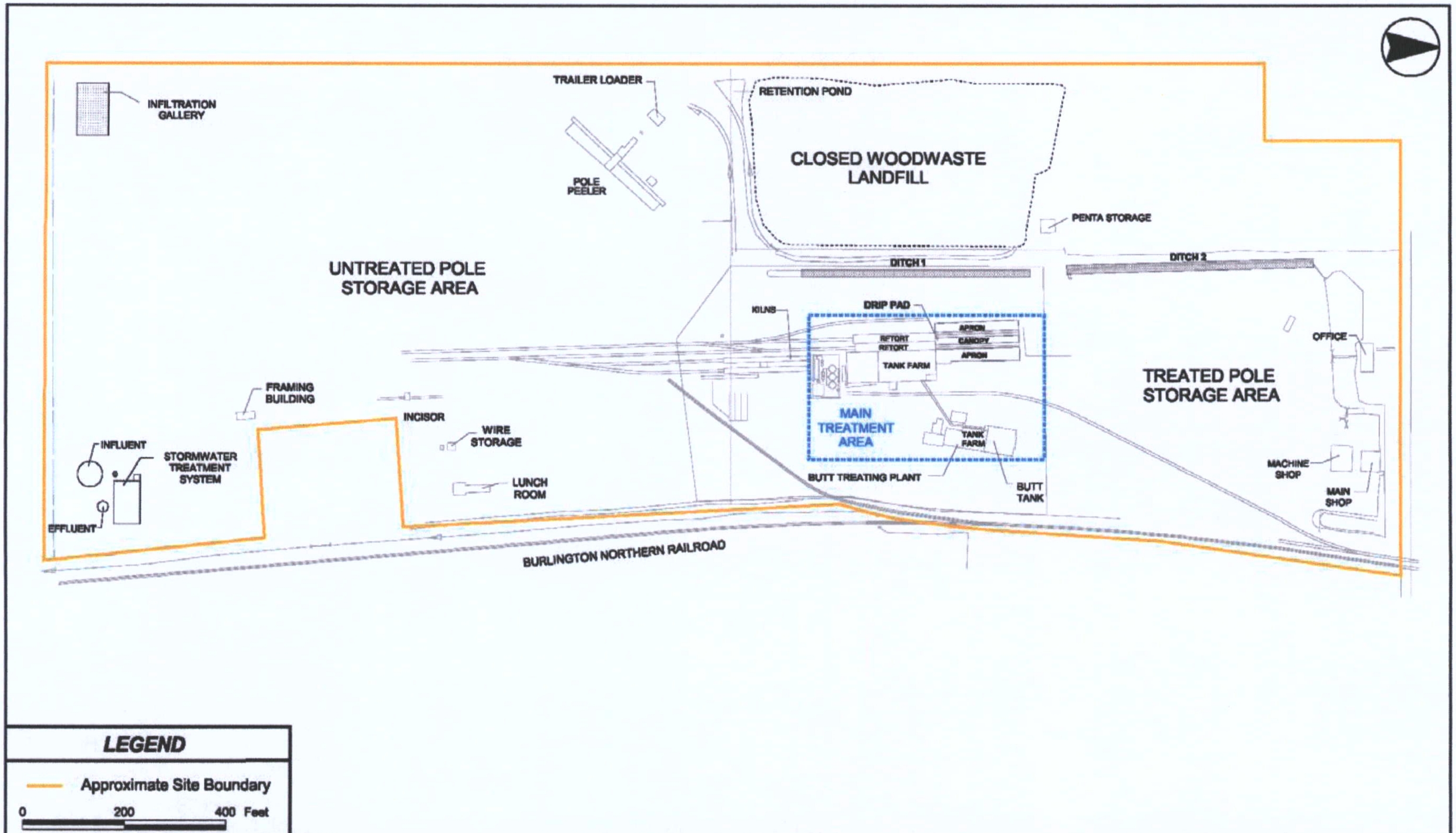

Figure 1. Site layout

PREMIER J.H.Baxter

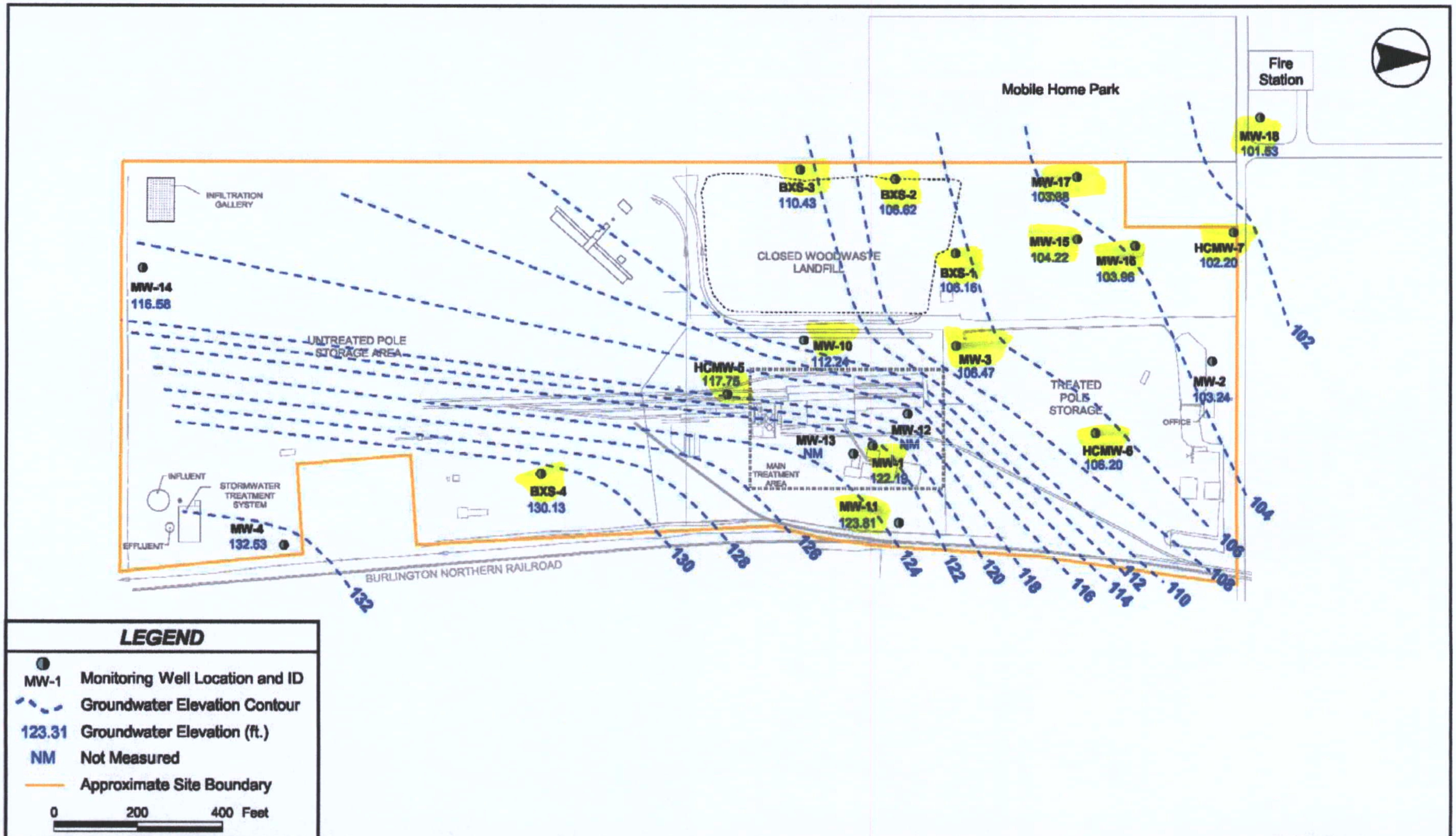

Figure 2. Groundwater elevations (January 2003)

PREMIER J.H. Baxter

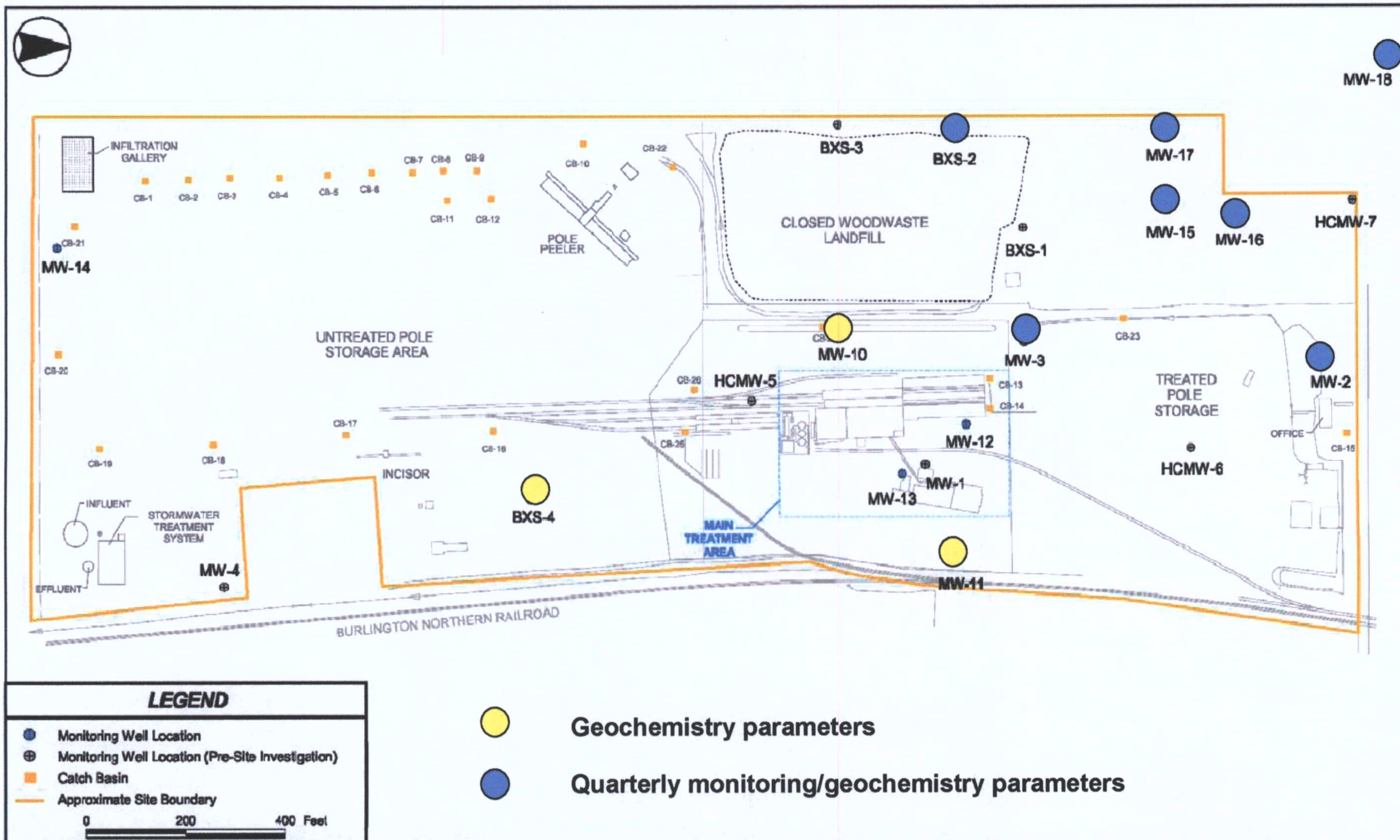

Figure 3. Proposed monitoring well locations

PREMIER JH Baxter